

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in this application.

Listing of Claims:

Claim 1 (Currently Amended): A method for manufacturing an object having a potential $\{x\}$ that is generated in response to a field $\{f\}$ applied thereto, the method comprising:

generating a computerized mathematical model of the object by discretizing a geometric model of the object into a plurality of finite elements and specifying values for the field $\{f\}$ and potential $\{x\}$ relative to the finite elements;

~~specifying that the material properties of the finite elements have a particular symmetry;~~

calculating a material property matrix $[k]$ based on the force $\{f\}$ and the potential $\{x\}$ relationship $\{f\}=[k]\{x\}$ and the specified symmetry;

extracting material property coefficients from the material property matrix $[k]$ for each finite element in the computerized mathematical model;

comparing the extracted material property coefficients to material property coefficients for known materials to match the extracted material property coefficients to the material property coefficients for known materials;

determining manufacturing equipment control parameters ~~for controlling manufacturing equipment~~ for each volume increment of the object based on the matched material property coefficients;

controlling the manufacturing equipment in accordance with the determined manufacturing equipment control parameters to thereby manufacture the object; ~~and~~

wherein, if the matched material property coefficients correspond to a composite material, the manufacturing equipment control parameters comprises parameters for

controlling composite manufacturing equipment and the controlling of the manufacturing equipment comprises controlling composite manufacturing equipment, and
wherein the composite material comprises structural fibers laminated in a matrix
into which an impurity is introduced, the amount of the impurity introduced into the
matrix being controllably variable for the respective volume increments of the object
~~introducing an impurity into the object while the object is manufactured, wherein~~
~~an amount of the introduced impurity is variable for the respective volume increments of~~
~~the object.~~

Claim 2 (Currently Amended): The method according to claim 56 ~~1~~,
wherein the material properties of the finite elements are specified to be isotropic.

Claim 3 (Currently Amended): The method according to claim 56 ~~1~~,
wherein the material properties of the finite elements are specified to be transversely
isotropic.

Claim 4 (Previously Presented): The method according to claim 1, wherein
the generating of a computerized mathematical model of the object further includes
determining the smallest volume increment that can be manufactured using the
manufacturing equipment.

Claim 5 (Original): The method according to claim 1, wherein the field {f} is a
mechanical force field and the potential {x} is a displacement.

Claim 6 (Original): The method according to claim 1, wherein the field {f} is
an electric current field and the potential {x} is a voltage.

Claim 7 (Original): The method according to claim 1, wherein the field {f} is a
magnetic field and the potential {x} is a magnetic vector potential.

Claim 8 (Original): The method according to claim 1, wherein the field {f} is a thermal flux field and the potential {x} is a temperature.

Claim 9 (Original): The method according to claim 1, wherein the field {f} is a fluid velocity field and the potential {x} is a fluid potential.

Claims 10 and 11 (Canceled).

Claim 12 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises biologic material.

Claim 13 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises bone.

Claim 14 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises crushed bone.

Claim 15 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises co-factors.

Claim 16 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises biological cells.

Claim 17 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises bio-active materials.

Claim 18 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises medications.

Claim 19 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises antibiotics.

Claim 20 (Currently Amended): The method according to claim 1 ~~11~~, wherein the impurity comprises radioactive materials.

Claim 21 (Previously Presented): The method according to claim 1, wherein the object being manufactured is a prosthetic implant for replacing a body part and the field {f} and potential {x} are specified based on the in vivo forces applied to the body part to be replaced and the in vivo displacements generated in the body part to be replaced when the forces are applied thereto.

Claim 22 (Previously Presented): An object made in accordance with the method of claim 1, wherein the object is selected from the group consisting of an automobile part, an aircraft part, a prosthetic implant, a golf club shaft, a tennis racket, a bicycle frame, and a fishing pole, and wherein different portions of the object have different material properties corresponding to the matched extracted material property coefficients for known materials.

Claim 23 (Original): A prosthetic implant manufactured in accordance with the method of claim 1.

Claim 24 (Original): A golf club manufactured in accordance with the method of claim 1.

Claim 25 (Previously Presented): A computer-implemented method for determining machine control instructions for manufacturing an object having a potential {x} that is generated in response to a field {f} applied thereto, the method comprising:

generating a computerized mathematical model of the object by discretizing a geometric model of the object into a plurality of finite elements and specifying values of the field {f} and potential {x} relative to the finite elements;

~~specifying that the material properties of the finite elements have a particular symmetry;~~

calculating a material property matrix $[k]$ based on the force $\{f\}$ and potential $\{x\}$ relationship $\{f\}=[k]\{x\}$ and the specified symmetry;

extracting material property coefficients from the material property matrix $[k]$ for each finite element in the computerized mathematical model;

comparing the extracted material property coefficients to material property coefficients for known materials to match the extracted material property coefficients to the material property coefficients for known materials;

determining manufacturing equipment control parameters ~~for controlling manufacturing equipment~~ for each volume increment of the object based on the matched material property coefficients; and

generating machine control instructions for controlling the manufacturing equipment in accordance with the manufacturing equipment control parameters to manufacture the object; ~~and~~

wherein, if the matched material property coefficients correspond to a composite material, the manufacturing equipment control parameters comprise parameters for controlling composite manufacturing equipment and the machine control instructions comprise instructions for controlling the composite manufacturing equipment, and

wherein the composite material comprises structural fibers laminated in a matrix into which an impurity is introduced, the amount of the impurity introduced into the matrix being controllably variable for the respective volume increments of the object

~~generating further machine control instructions for controlling the manufacturing equipment to introduce an impurity into the object while the object is manufactured, wherein an amount of the introduced impurity is variable for the respective volume increments of the object.~~

Claim 26 (Previously Presented): The method according to claim 25, wherein the object being manufactured is a prosthetic implant for replacing a body part and the field $\{f\}$ and potential $\{x\}$ are specified based on the in vivo forces applied to the body part to be replaced and the in vivo displacements generated in the body part to be replaced when the forces are applied thereto.

Claims 27 and 28 (Canceled).

Claim 29 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises biologic material.

Claim 30 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises bone.

Claim 31 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises crushed bone.

Claim 32 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises co-factors.

Claim 33 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises biological cells.

Claim 34 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises bio-active materials.

Claim 35 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises medications.

Claim 36 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises antibiotics.

Claim 37 (Currently Amended): The method according to claim 25 ~~28~~, wherein the impurity comprises radioactive materials.

Claim 38 (Original): A computer system programmed to perform the method of claim 25.

Claim 39 (Currently Amended): A control system programmed with machine control instructions for controlling composite manufacturing equipment to manufacture the $[[a]]$ composite object, wherein the machine control instructions are generated in accordance with the method of claim 25.

Claim 40 (Currently Amended): Composite manufacturing equipment comprising a control system programmed with machine control instructions for controlling the composite manufacturing equipment to manufacture the $[[a]]$ composite object, wherein the machine control instructions are generated in accordance with the method of claim 25.

Claim 41 (Currently Amended): A method for manufacturing an object for which a defined field $\{f\}$ generates a potential $\{x\}$ in response thereto, the method comprising:

(1) generating a computerized mathematical model of the object by discretizing a geometric model of the object into a plurality of finite elements;

(2) specifying values of the field $\{f\}$ and the potential $\{x\}$ relative to the finite elements;

~~(3) specifying that the material properties of the finite elements have a particular symmetry;~~

~~(3) (4) calculating a material property matrix $[k]$ based on the force $\{f\}$ and the potential $\{x\}$ relationship $\{f\}=[k]\{x\}$ and the specified symmetry, wherein the material property matrix $[k]$ comprises a plurality of values each corresponding to one or more material property coefficients;~~

~~(4) (5) comparing each of the plurality of values in the material property matrix $[k]$ to known material properties and, responsive to a match, selecting a corresponding manufacturing process parameter for a volume increment of the object, wherein the selected manufacturing process parameter is usable for controlling composite manufacturing equipment if the matched known material property is a material property for a composite material;~~

(5) ~~(6)~~ controlling the composite manufacturing equipment in accordance with the selected manufacturing process parameters to thereby manufacture the object,[[; and]]

wherein the composite material comprises structural fibers laminated in a matrix into which an impurity is introduced, the amount of the impurity introduced into the matrix being controllably variable for the respective volume increments of the object

~~(7) — introducing an impurity into the object while the object is manufactured, wherein an amount of the introduced impurity is variable for the respective volume increments of the object.~~

Claim 42 (Previously Presented): The method according to claim 41, wherein the object being manufactured is a prosthetic implant for replacing a body part and the field {f} and potential {x} are specified based on the in vivo forces applied to the body part to be replaced and the in vivo displacements generated in the body part to be replaced when the forces are applied thereto.

Claims 43 and 44 (Canceled).

Claim 45 (Previously Presented): The method according to claim 41, wherein the impurity is selected from the group consisting of: biologic materials, bone, crushed bone, co-factors, biological cells, bio-active material, medications, antibiotics, and radioactive materials.

Claims 46-55 (Canceled).

Claim 56 (New): The method according to claim 1, further comprising:

specifying that the material properties of the finite elements have a particular symmetry.